(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 787 552 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
22.03.2000 Bulletin 2000/12

(51) Int Cl.[7]: **B23D 21/00**, B23D 33/02, B23Q 5/50

(21) Application number: **96112862.6**

(22) Date of filing: **09.08.1996**

(54) **A device for feeding and discharging a work in an automatic hollow pipe cutting apparatus**

Eine Vorrichtung zum Fördern und Entladen eines Werkstückes in einem automatischen Schneidgerät für hohle Rohre

Un dispositif pour approvisionner et décharger une pièce dans un appareil automatique à couper des tubes creux

(84) Designated Contracting States:
CH DE GB IT LI

(30) Priority: **18.08.1995 JP 21077095**

(43) Date of publication of application:
06.08.1997 Bulletin 1997/32

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EP 0 787 552 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to a device for feeding and discharging a work in an automatic hollow pipe cutting apparatus according to the preamble of claim 1 and as known from EP-A-0 364 405.

[0002] JP-A-3-19719 discloses a pipe shearing device. This known shearing device is provided with a fixed die core and a movable die core, these die cores being inserted into a pipe to be sheared. The movable die core is however loosely fitted in the pipe, and, therefore, the pipe is not clamped by the movable die core in the inside of the pipe and by the fixed die core in the outside of the pipe. Accordingly, the pipe is sheared in movable state and cannot be sheared precisely.

[0003] EP-A-0 364 405 (& JP-A-2-190211) disclose shearing blade mount for cut-off die set. This known shearing blade mount relates to a shearing blade assembly for use in a double cut die set of the type used to cut tubing continuously emanating from a pipe mill. This shearing blade assembly used in conjunction with the notching blade of the cut-off die set. This device includes a mounting block fixed to the upper platen of a die set, and a shearing blade mounted to a shearing blade carriage. The shearing blade cartridge is then inserted into the mounting block and is retained in a position by a cam lock assembly. The cam lock assembly and carriage system allows the shearing blade to be quickly and effectively removed and replaced as needed. However, this shearing blade assembly does cut the pipe which is clamped in the outside of the pipe by two opposite jaws, but the pipe is not clamped in the inside of the pipe by a movable die core, therefore the pipe cannot be cut undeformedly and precisely.

[0004] It is therefore an object of the present invention to eliminate such defects in the prior art.

[0005] In order to attain the above object, according to an aspect of the present invention, a device for feeding and discharging a work in an automatic hollow pipe cutting apparatus comprises: a cutter device for cutting a hollow pipe; a cam lever driving mechanism for sending the hollow pipe to the cutter device; a fixed chuck device disposed near the cutter device; a movable chuck device disposed away from the cutter device; a movable die core disposed inside the cutter device and inside the hollow pipe; another cam lever driving mechanism for moving the movable chuck device; a stopper and ejector fitted to the fixed die core; whereby when the hollow pipe is fed to the cutter device, the fixed chuck device grasps and release the hollow pipe and the movable chuck device also grasps and release the hollow pipe but at timing different from grasping and releasing by the fixed chuck means and the feeding of the hollow pipe into the cutter device is performed by movement of the movable chuck device by means of the other cam lever driving mechanism, and after the hollow pipe is cut, during lowering of a slider which accommodate the stopper and ejector and a movable shearing cutter of the cutter device, the stopper and ejector is sent back by means of a cam in the direction reverse to the feeding direction of the hollow pipe into the cutter device so that a cut piece is discharged.

Fig. 1 is a plan view of a device for feeding and discharging a work in an automatic hollow pipe cutting apparatus as an embodiment according to the present invention;

Fig. 2 is a front view of the work feeding and discharging device in the automatic hollow pipe cutting apparatus according to the present invention;

Fig. 3 is a center sectional view of a chuck device used in the work feeding and discharging device in the automatic hollow pipe cutting apparatus according to the present invention, said figure showing a fixed chuck device and a movable chuck device at the same time; and

Fig. 4 is a front view of a work discharging mechanism of the work feeding and discharging device in the automatic hollow pipe cutting apparatus according to the present invention.

[0006] A device for feeding and discharging a work in an auto-matic hollow pipe cutting apparatus according to the present invention will be described below on the basis of an embodiment illustrated in the accompanying drawings.

[0007] Referring to Figs. 1 to 3, a device for feeding and discharging a work in an automatic hollow pipe cutting apparatus according to the present invention is mounted on a base plate 1 of a not-shown machine carriage. A cam shaft 2 is rotatably supported by a pair of right and left brackets 3 in the drawing so that the cam shaft 2 is continuously rotated by the rotation force transmitted through a timing pulley 4 and a timing belt 5 from a not-shown motor-driven main shaft. An elevation cam for driving the elevation of a slider 55 is supported by the cam shaft 2. The slider 55 accommodates a movable shearing cutter 51 of a cutter device 50 for cutting a hollow pipe. A cam 6 for moving a movable chuck device 45, a cam 8 for controlling a chuck opening/closing operation lever 18, and a cam 10 for controlling a chuck opening/closing operation lever 12 are fixedly mounted on the cam shaft 2 in this order from the right to the left in Fig. 1.

[0008] Fig. 3 shows a center sectional view of a chuck device used in the work feeding and discharging device in the automatic hollow pipe cutting apparatus in which the pipe to be cut is fed in the longitudinal direction by means of a fixed chuck device and a movable chuck device. Since the constitutional elements of said both chuck devices are the same, said elements in the conditions of a fixed chuck and of a movable chuck are explained in one drawing (Fig. 3).

[0009] The cam 6 has a cam groove 7 in its circumference, the cam 8 has a cam face 9 which is in contact

with a cam contact portion 19 of the chuck opening/closing operation lever 18 at its one end, and the cam 10 has a cam groove 11. The chuck opening/closing operation lever 12 is provided with a roller 14 rotatably fixed by means of a roller pin 13 on one end of the chuck opening/closing operation lever 12 so that the roller 14 is in contact with a cam face of the cam groove 11. The chuck opening/closing operation lever 12 is pivotally supported, by means of a pivot 15, on a chuck housing 31 of a fixed chuck device 30. A roller 17 is rotatably supported, by means of a roller pin 16, on the other end of the chuck opening/closing operation lever 12 so that the roller 17 is engaged into an operating groove of a chuck opening/closing cam 42 of the fixed chuck device 30. The chuck opening/closing cam 42 is provided at its right end with a cam face like a truncated cone and is arranged so that the chuck opening/closing cam 42 per se moves, on a chuck device body 34, the in the axial direction of a hollow pipe 48. Thus, when the chuck opening/closing operation lever 12 is turned by the chuck opening/closing operation lever controlling cam 10, the chuck opening/closing cam 42 moves, pawls 36 are pushed at their one ends so as to respectively turn around pins 37 fixed to the chuck device body 34, a sleeve 35 for chuck opening/closing operation is moved left in Fig. 3 by the other ends of the respective pawls 36, and an extension sleeve 33 of the fixed chuck device 30 is closed so that the hollow pipe 48 is immovably grasped in the vicinity of a movable die core 49.

[0010] The chuck opening/closing operation lever 18 of the movable-chuck device 45 is pivotally supported by a pivot 20 on a chuck housing 31' of the movable chuck device 45', said housing of the movable chuck device being different from said housing 31 of fixed chuck device 30 only in a point that this housing 31 is provided with cam groove 46 (Figs. 1 and 3). A roller 22 is rotatably pivoted by a roller pin 21 at the other end of the chuck opening/closing operation lever 18. Also in the movable chuck device 45, similarly to the fixed chuck device 30, the roller 22 is engaged into an operating groove of a chuck opening/closing cam 42. Accordingly, the chuck opening/closing operation lever 18 is urged through its cam contact portion 19 to turn around the pivot 20 by means of the cam 8 for controlling the chuck opening/closing operation lever 18, so that a chuck opening/closing cam 42 is thereby moved in the axial direction of the hollow pipe 48 (shown in the upper half of Fig. 3), pawls 36 are turned around respective pins 37 by means of the chuck opening/closing cam 42, a sleeve 35 for chuck opening/closing operation is moved left in Fig. 3 by the other ends of the respective pawls 36, and an extension sleeve 33 of the movable chuck device 45 is closed so that the hollow pipe 48 is grasped (shown in the upper half of Fig. 3).

[0011] The pawls of the movable chuck assembly 45 comprise a knurled or serrated tip, in order to feed the pipe 48 under engagement of said knurled or serrated tip of the pawl 36 with the outer surface of the pipe 48 in the longitudinal direction.

[0012] The pawl 36 of the fixed chuck assembly 30 has a shorter arm-length in order not to engage with the outside of the pipe 48, whereas the pawl 36 of the movable chuck assembly 45 has a longer arm-length in order to engage with the outside of the pipe 48, since the fixed chuck assembly 30 works only for clamping and releasing the pipe 48 which is comparable with the functions of the movable chuck assembly 45 for feeding and releasing the pipe 48. Moreover, the pawl of the fixed chuck assembly does not have a knurled or serrated tip.

[0013] The grasping and release of the hollow pipe 48 by means of the extension sleeve 33 in the movable chuck device 45 are carried out in relation with but in timing different from the grasping and release of the hollow pipe 48 by means of the extension sleeve 33 in the fixed chuck device 30. That is, when the movable chuck device 45 has grasped the hollow pipe 48, the movable chuck device 45 moves toward the cutter device 50 while grasping the hollow pipe 48 and stops moving at a position where the left end of the hollow pipe 48 comes into contact with the right end of a stopper and ejector 56 as shown in Fig. 4. At that time, also the fixed chuck device 30 grasps the hollow pipe 48 and automatic cutting of the hollow pipe 48 is carried out by means of the cutter device 50. After automatic cutting of the hollow pipe 48, the fixed chuck device 30 releases the hollow pipe 48, and also the movable chuck device 45 releases the hollow pipe 48 and retreats from the cutter device 50 in the direction opposite to the feeding direction of the hollow pipe 48 (rightward in Fig. 2). The movable chuck device 45 grasps the hollow pipe 48 again in the retreated position, and the next work feeding cycle is started.

[0014] A roller 25 pivoted, by a roller pin 24, on one end of an operation lever 23 for moving the movable chuck device 45 is engaged into the cam groove 7 of the cam 6 for moving the movable chuck device 45. The operation lever 23 for moving the movable chuck device 45 is pivotally supported, by means of a pivot 26, on the base plate 1. A roller 28 is rotatably supported, by means of a roller pin 27, on the other end of the operation lever 23 for moving the movable chuck device 45 so that the roller 28 is engaged into an operation groove 46 formed in the housing 31' of the movable chuck device 45. Thus, the operation lever 23 is turned by the rotation of the cam 6 so that the movable chuck device 45 is made to perform reciprocating movement in the axial direction of the hollow pipe 48. When the movable chuck device 45 moves forward and moves backward, the cam contact portion 19 of the chuck opening/closing operation lever 18 slides on the cam face 9 of the cam 8 for controlling the chuck opening/closing operation lever 18 while contacting with the cam face 9. In this case, since the cam face 9 is formed so that it has the same contour in any position in the axial direction of the cam shaft 2, the turning operation of the chuck opening/closing operation lever 18 is not influenced by the movement

of the movable chuck device 45 but it is controlled only by the cam diagram of the cam face 9 of the cam 8 for controlling the chuck opening/closing operation lever 18, regardless of the state of the movable chuck device 45 as to whether the movable chuck device 45 is moving or not.

[0015] When the hollow pipe 48 is being cut, the forward end of the hollow pipe 48 is pressed against the end surface of the stopper and ejector 56, and, in the inside of the hollow pipe 48, the end of a fixed die core 60 which is fitted into the hollow pipe 48 by a predetermined size is in contact with the forward end of a movable die core 49 which is fitted into the hollow pipe 48 by a predetermined size so that the position of the hollow pipe 48 is immovably grasped during the cutting operation. Accordingly, accurate cutting of the hollow pipe 48 is ensured in the axial direction as well as in the radial direction and the length, the external form and the inside diameter of a cut piece is ensured with predetermined accuracy.

[0016] After the hollow pipe 48 is cut, during lowering of the slider 55 which accommodate the movable shearing cutter 51 of the cutter device 50 and the stopper and ejector 56 fitted to fixed die core 60, a cut piece 48' is discharged from the fixed die core 60 by the stopper and ejector 56 by the mutual movement between a grooved cam 63 for the stopper and ejector 56 and a grooved cam 64 for the fixed die core 60.

[0017] Further, the reference numeral 32 designates an adjusting ring which is fixed to the extension sleeve 33. The adjusting ring 32 cooperates with the extension sleeve 33 so as to clamp the pipe 48 to be cut. The reference numeral 38 designates a bracket provided with the pins 37 which bear the pawls swingably. The reference numerals 40 and 41 designate nuts which are used to secure the bracket 38 to the chuck device housing 31 and to secure the body 34 to the chuck device, respectively.

[0018] The reference numerals 47, 47', and 47'' designate guides for movable chuck device 45, the guides being arranged on the base plate 1 so as to guide the movable chuck device 45 in the longitudinal direction.

[0019] The reference numeral 52 designates a fixed shearing cutter fixed to a support 53 for supporting the fixed shearing cutter 52. The fixed shearing cutter 52 cooperates with the movable shearing cutter 51 to cut the pipe 48 under application of shearing force between the cutters 51 and 52.

[0020] The reference numeral 57 designates a bracket to which the stopper and ejector 56 is fixed. The stopper and ejector 57 is used to stop the feeding of the pipe 48 in the longitudinal direction and is used to eject the cut piece 48' outside the cutting apparatus after cutting operation.

[0021] The reference numeral 59 designates a roller rotatably supported on a roller pin 58 which is secured to the bracket 57. The roller 59 is engaged with the groove of the grooved cam 63 for the stopper and ejector 56. The reference numeral 62 designates a roller rotatably supported on a roller pin 61 which is secured to the fixed die core 60 across its longitudinal axis. The roller 62 is engaged with the groove of the grooved cam 64 for the fixed die core 60.

[0022] According to the present invention, the work feeding/discharging can be carried out rapidly and accurately. The work can be worked with predetermined preciseness in its length, and inner and outer diameters. Further, no burr or no injury is produced in the work and therefore no additional working step to eliminate such defects.

Claims

1. A device for feeding and discharging a work in an automatic hollow pipe cutting apparatus, said device comprising: a cutter device (50) for cutting a hollow pipe (48); a cam lever driving mechanism (8,10;18,12) for sending said hollow pipe (48) to said cutter device (50); a fixed chuck device (30) disposed near said cutter device (50); the work feeding and discharging device being characterized in that it further includes a movable chuck device (45) disposed away from said cutter device (50); a movable die core (49) disposed inside said cutter device (50) and inside said hollow pipe (48); another cam lever driving mechanism (6,23) for moving said movable chuck device (45); a stopper and ejector (56) fitted to a fixed die core (60); whereby when said hollow pipe (48) is fed to said cutter device (50), said fixed chuck device (30) grasps and release said hollow pipe (48) and said movable chuck device (45) also grasps and release said hollow pipe (48) but at timing different from grasping and releasing by said fixed chuck means (30) and the feeding of said hollow pipe (48) into said cutter device (50) is performed by movement of said movable chuck device (45) by means of said other cam lever driving mechanism (6,23), and after said hollow pipe (48) is cut to obtain a cut piece (48'), during lowering of a slider (55) which accommodate said stopper and ejector (56) and a movable shearing cutter (51) of said cutter device (50), said stopper and ejector (56) is sent back by means of a cam (63) in the direction reverse to the feeding direction of said hollow pipe (48) into said cutter device (50) so that said cut piece (48') is discharged.

2. The work feeding and discharging device according to claim 1, wherein when said hollow pipe (48) is being automatically cut, said movable die core (49) in said cutter device (50) is held immovably relative to said fixed die core (60) by the grasping of said hollow pipe (48) by said fixed chuck device (30).

3. The work feeding and discharging device according

to claim 1 or 2, wherein in order to discharge said cut piece (48') after said hollow pipe (48) is automatically cut, said stopper and ejector (56) accommodated in said slider (55) is disposed so as to be movable by said cam (63) in the direction reverse to the feeding direction of said hollow pipe (48) into said cutter device (50).

Patentansprüche

1. Einrichtung zur Zufuhr und Ausgabe eines Werkstückes in einer automatischen Hohlrohr-Schneidevorrichtung, die Einrichtung mit:

   einer Schneideinrichtung (50) zum Schneiden eines hohlen Rohres (48);
   einem Nocken-Antriebsmechanismus (8,10; 18,12) zum Schicken des hohlen Rohres (48) zu der Schneideinrichtung (50);

   einer nahe der Schneideinrichtung (50) angeordneten, feststehenden Einspanneinrichtung (30); die Zufuhr- und Ausgabeeinrichtung für Werkstücke ferner gekennzeichnet durch

   eine entfernt von der Schneideinrichtung (50) angeordnete, bewegliche Einspanneinrichtung (45); einen innerhalb der Schneideinrichtung (50) und innerhalb des hohlen Rohres (48) angeordneten, beweglichen Spannkern (49) ;
   einen anderen Nocken-Antriebsmechanismus (6,23) zur Bewegung der beweglichen Einspanneinrichtung (45); einen an einem feststehenden Spannkern (60) angebrachten Anschlag und Auswerfer (56);

   wobei, wenn das hohle Rohr (48) der Schneideinrichtung (50) zugeführt wird, die feststehende Einspanneinrichtung (30) das hohle Rohr (48) ergreift und freigibt und die bewegliche Einspanneinrichtung (45) auch das hohle Rohr (48) ergreift und freigibt, jedoch mit einer von dem Ergreifen und Freigeben durch das feststehende Einspannmittel (30) verschiedenen Zeiteinteilung, und wobei die Zufuhr des hohlen Rohrs (48) in die Schneideinrichtung (50) durch Bewegung der beweglichen Einspanneinrichtung (45) mittels des anderen Nocken-Antriebsmechanismus (6, 23) durchgeführt wird und wobei, nachdem das hohle Rohr (48) zum Erhalt eines Schnittstückes (48') geschnitten wurde, während des Absenkens eines Schiebers (55), der den Anschlag und Auswerfer (56) und einen beweglichen Abscherschneider (51) der Schneideinrichtung (50) aufnimmt, der Anschlag und Auswerfer (56) mittels eines Nockens (63) in eine Richtung entgegen der Zufuhrrichtung des hohlen Rohres (48) in die Schneideinrichtung (50) zurückgeschickt wird, so daß das Schnittstück (48') ausgeworfen wird.

2. Zufuhr- und Ausgabeeinrichtung für Werkstücke nach Anspruch 1, bei der, wenn das hohle Rohr (48) automatisch geschnitten wird, der bewegliche Spannkern (49) in der Schneideinrichtung (50) relativ zu dem feststehenden Spannkern (60) durch Ergreifen des hohlen Rohres (48) durch die feststehende Einspanneinrichtung (30) unbeweglich gehalten wird.

3. Zufuhr- und Ausgabeeinrichtung für Werkstücke nach Anspruch 1 oder 2, bei der zur Ausgabe des Schnittstückes (48') nach dem automatischen Schneiden des hohlen Rohres (48) der in dem Schlitten (55) aufgenommene Anschlag und Auswerfer (56) derart angeordnet wird, daß er durch den Nocken (63) in die Richtung entgegen der Zufuhrrichtung des hohlen Rohres (48) in die Schneideinrichtung (50) bewegbar ist.

Revendications

1. Un dispositif pour approvisionner et décharger une pièce dans un appareil automatique à couper les tubes creux, ledit dispositif comprenant : un dispositif de coupe (50) pour couper un tube creux (48) ; un mécanisme d'entraînement de levier à came (8,10, 18 ; 12) pour envoyer ledit tube creux (48) audit dispositif de coupe (50) ; un dispositif fixe de serrage par mandrin (30) disposé à proximité dudit dispositif de coupe (50), le dispositif d'approvisionnement et de décharge d'une pièce étant caractérisé en ce qu'il

   inclut en outre un dispositif mobile de serrage par mandrin (45) disposé à distance dudit dispositif de coupe (50) ; un noyau de serrage mobile (49) disposé à l'intérieur dudit dispositif de coupe (50) et à l'intérieur dudit tube creux (48) ; un autre mécanisme d'entraînement de levier à came (6, 23) pour déplacer ledit dispositif de serrage mobile par mandrin(45) ; un butoir et un éjecteur (56) fixé sur un dit noyau de serrage fixe (60) ; quand ledit tube creux (48) est approvisionné audit dispositif de coupe (50), ledit dispositif de serrage fixe par mandrin (30) agrippant et relâchant ledit tube creux (48) et ledit dispositif de serrage mobile par mandrin(45) agrippant et relâchant également ledit tube creux (48) mais à un moment différent de la saisie et du relâchement effectués par ledit moyens de serrage fixe par mandrin (30) et l'approvisionnement dudit tube creux (48) dans ledit dispositif de coupe (50) étant effectué par déplacement dudit dispositif de serrage mobile par mandrin(45) au moyen dudit autre mécanisme d'entraînement de levier à came (6, 23), puis ledit tube creux (48) étant coupé pour obtenir

une pièce coupée (48') pendant l'abaissement d'une coulisse (55) qui loge ledit butoir et éjecteur (56) et une lame de cisaillement (51) dudit dispositif de coupe (50), ledit butoir et éjecteur (56) étant renvoyé au moyen d'une came (63) dans le sens inverse à la direction d'approvisionnement dudit tube creux (48) dans ledit dispositif de coupe (50) de sorte que ladite pièce coupée (48') est déchargée.

2. Le dispositif d'approvisionnement et de déchargement de pièce selon la revendication 1, dans lequel ledit tube creux (48) est coupé automatiquement, ledit noyau de serrage mobile (49) dans ledit dispositif de coupe (50) étant maintenu immobile de manière relative par rapport audit noyau de serrage (60) par l'agrippement dudit tube creux (48) dudit dispositif de serrage fixe par mandrin (30).

3. Le dispositif d'approvisionnement et de déchargement de pièce selon la revendication 1 ou 2, dans lequel en vue de décharger ladite pièce coupée (48') après que ledit tube creux (48) est coupé automatiquement, ledit butoir et éjecteur (56) logé dans ladite coulisse (55) est disposé de manière à être mobile par ladite came (63) dans le sens inverse à la direction inverse d'approvisionnement dudit tube creux (48) dans ledit dispositif de coupe (50).

Fig. 1

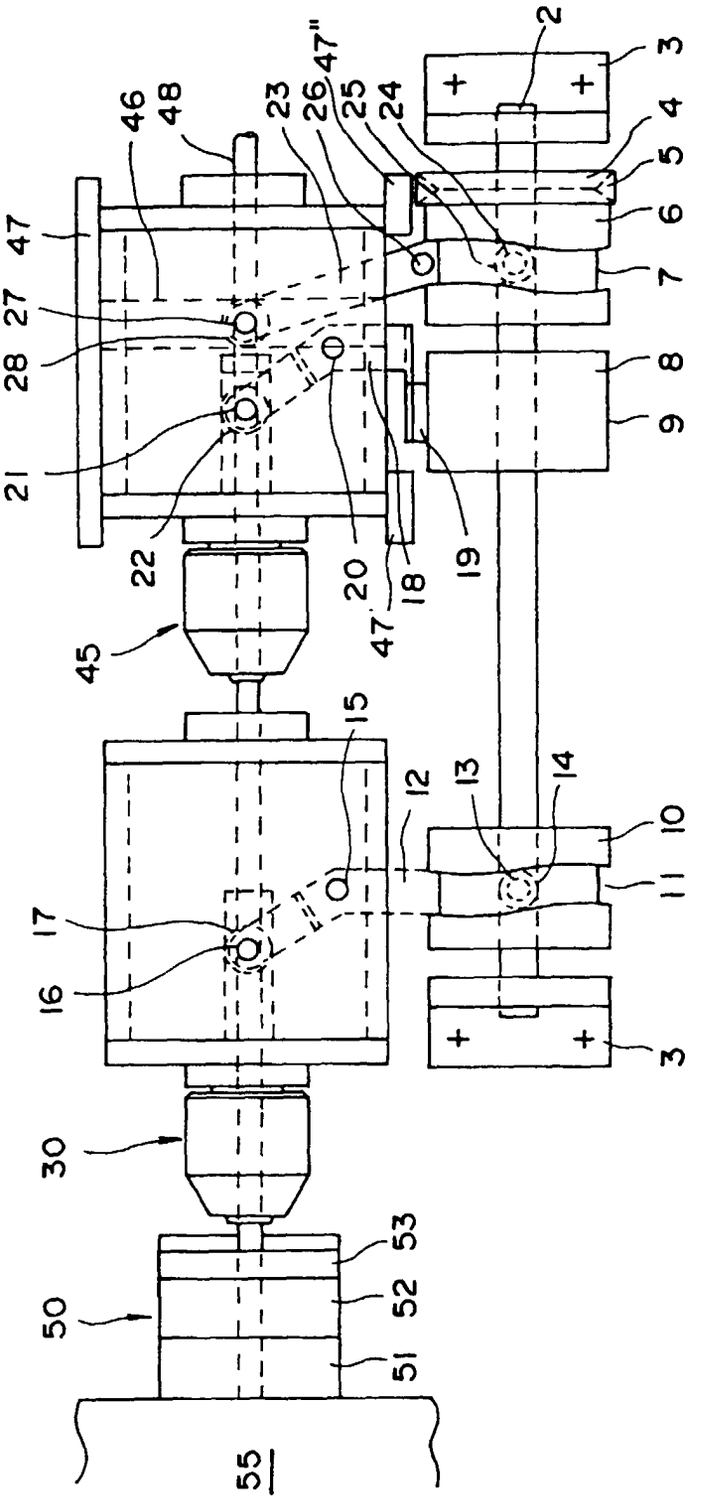
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Fig. 2

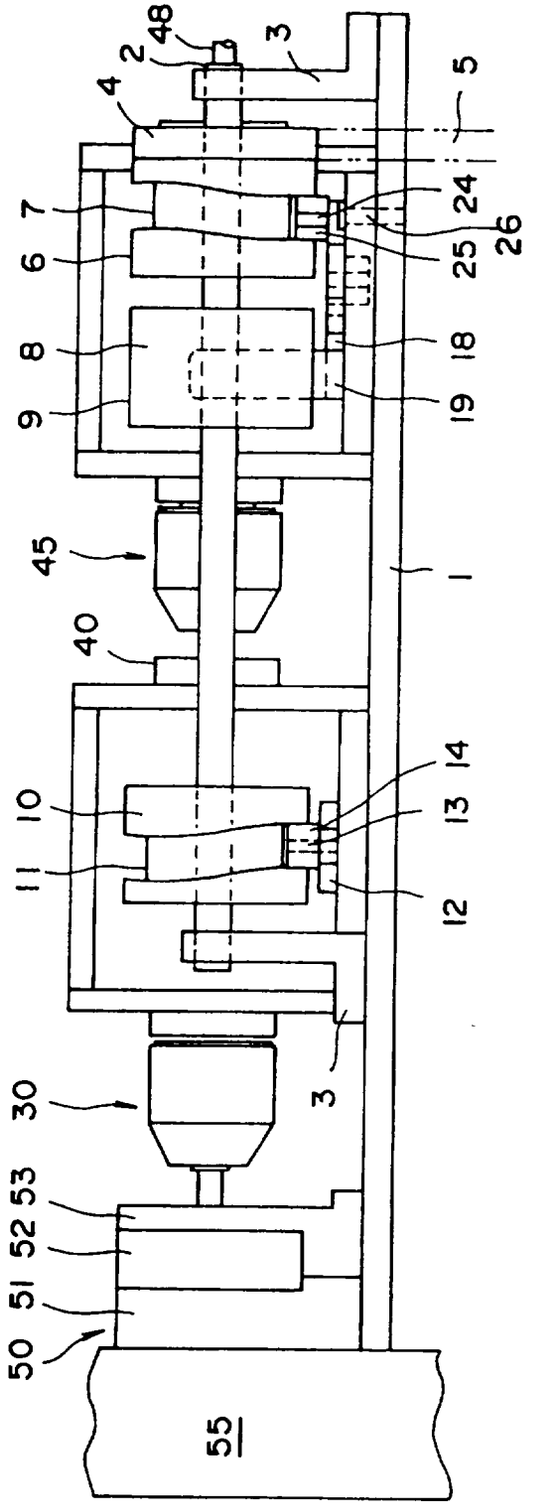

Fig. 3

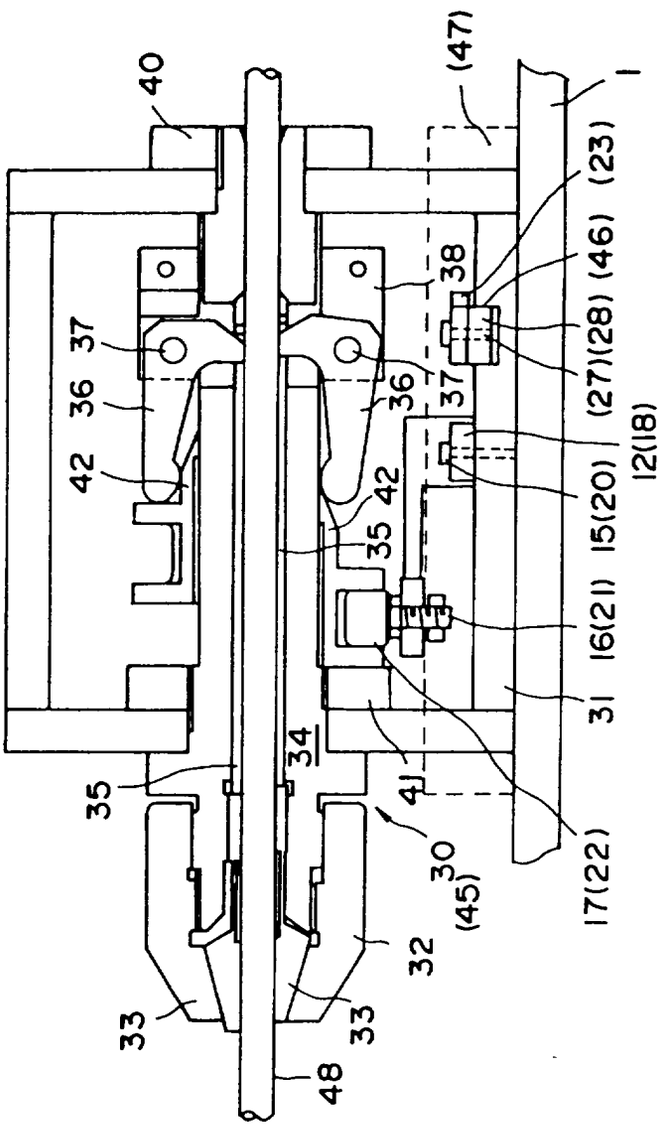
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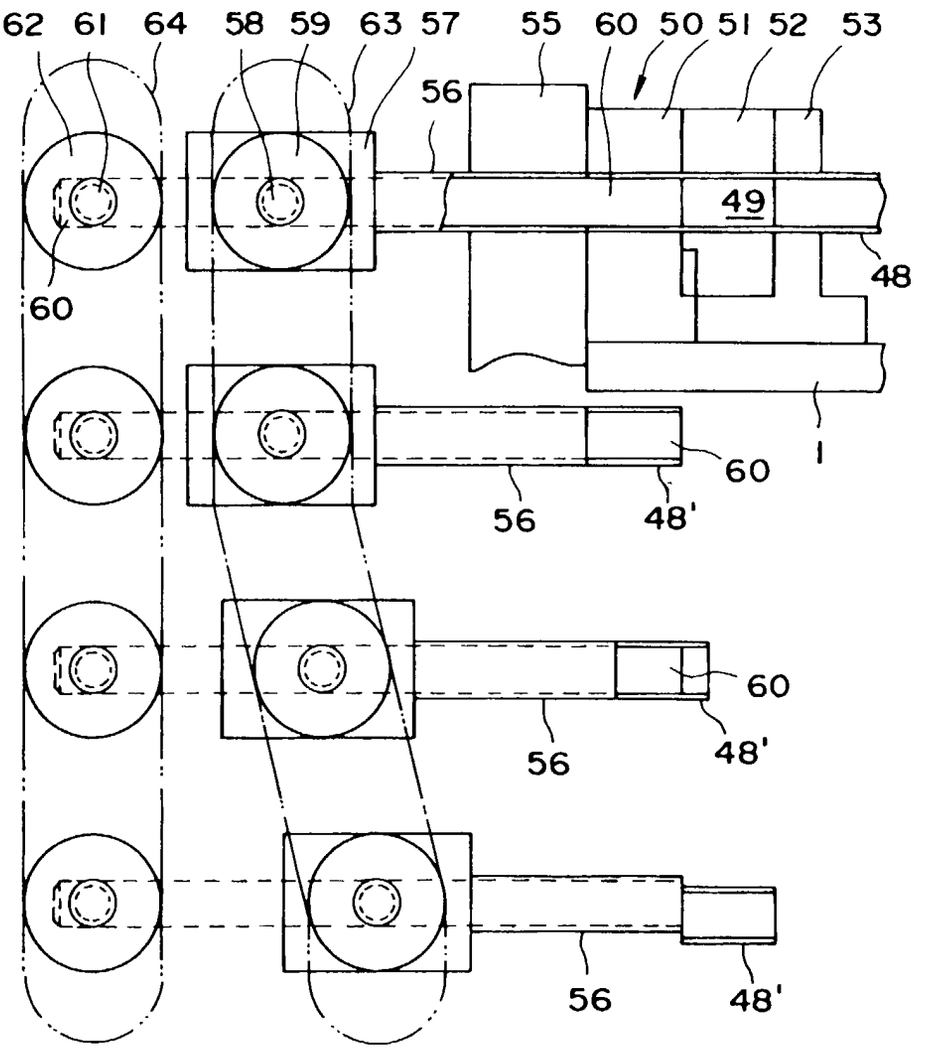
Fig. 4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